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AUTHOR Chimi, Carl J.; Gordon, Gene M.
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ABSTRACT

This paper discusses a number of innovative techniques that were used to teach courses in Information Systems to undergraduate and graduate students. While none of these techniques is individually innovative, the combination of techniques provides a true "hands-on" environment for students; because of the way that the components of the courses are structured, students literally cannot take exams or hand in assignments without learning the techniques. The techniques discussed include publishing all course documents (syllabi, handouts, and others) on the World Wide Web; having students use FTP (file transfer protocol) to hand in all course assignments and papers; using Netscape, HTML, and a shareware product called Webforms in conjunction with Microsoft Access and Microsoft Excel to administer exams; and creating newsgroups for each course to foster communication. Benefits and drawbacks to this approach are discussed. (Contains 13 references.) (Author/AEF)

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ED 422 929

USING INNOVATIVE INFORMATION SYSTEMS TECHNIQUES TO TEACH INFORMATION SYSTEMS

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Carl J. Chimi
Bloomsburg University

Gene M. Gordon
Bloomsburg University

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

This paper discusses a number of innovative techniques the authors have used to teach courses in Information Systems to undergraduate and graduate students. While none of these techniques is individually innovative, the combination of techniques provides a true "hands-on" environment for our students; because of the way that the components of our courses are structured, students literally cannot take exams or hand in assignments without learning these techniques. The techniques discussed include publishing all course documents (syllabi, handouts, etc.) on the Web; having students use ftp to hand in all course assignments and papers; using Netscape, HTML, and a shareware product called Webforms in conjunction with Microsoft Access and Microsoft Excel to administer exams; and creating newsgroups for each course to foster communication. Benefits and drawbacks to the authors' approach are discussed.

INTRODUCTION

History as we know it is fundamentally derived from human advances through invention and education. Historical records could not exist until humans developed technologies for recording their ideas and descriptions of their deeds. We can only surmise, therefore, how prehistoric youngsters studied, or if they indeed did. When humans discovered methods of writing, the nature of education changed dramatically. Socrates developed the present protocols for education over 3,000 years ago. The teacher stood in front of the students, who listened and were free to ask questions. It is evident that this system has been in operation since that time. A thunderbolt struck educational methods with the invention of the printing press. Soon after, for the first time, students were no longer tied to their teachers' classrooms but had the opportunity to explore worlds of diverse opinions, challenging ideas, even revolutionary thought. Books were at one time considered so dangerous that mass burnings took place during the Dark Ages around the 5th and 6th centuries with knowledge only barely flickering to light again through the Renaissance.

The classroom computer may not be in the same revolutionary category as the Gutenberg Bible. Although the effects of the classroom computer have not been well understood, enthusiasts have pushed their automated classrooms as vociferously as the last generation touted the Paperless office. On the other hand, critics have pointed out that nothing can replace human instructors and that pushing technology in the classroom could engulf students in a menacing Orwellian Cyberspace. Neither of these need be true. For all our technological advances, we cannot reject the concept of a teacher and a class. Civilization as we know it today has been achieved largely because that system works.

Bromley has stated that technology has been regarded as either an autonomous external force that drives the rest of society or as a neutral tool with no impact apart from its end use. In either case, technology and society are regarded as distinct entities rather than as an assimilated whole. So it is in education. The classroom and the computer are separate or only marginally integrated. Our efforts, as described below, have been to more seamlessly integrate learning about and using information systems technologies.

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LITERATURE REVIEW

A search of the literature reveals extensive work in previous research being applied in two or three areas: (1) kindergarten through high school education; (2) distance education and (3) Computer Assisted Instruction on a variety of levels. Innovative programs for children are being implemented with varying degrees of success across the country. The idea of the "virtual classroom" has led one academician to question the need for traditional forums (Crump). While the authors heartily applaud these endeavors, we believe that automated scenarios that work in school systems are not fully applicable to the mature atmosphere of the college campus; college students can generally be trusted and expected to learn independently about technology. On the other hand, the 18-to 22-year old college student - usually on his/her own for the first time in vastly different surroundings than the family nest - still requires training in those interpersonal skills that the virtual classroom cannot supply.

The authors believe that their approach to utilizing computer technology to meet the specific needs of undergraduates is fulfilling a neglected area in systems research. In the foreword for Campus Networking Strategies, Kenneth M. King, then president of EDUCOM said, "One of the grand challenges for technology in the coming decade is to create an electronic network linking every scholar in the world to every other scholar." (Arms) While those networks have now been set up and even extend beyond the academic community, there is a more pressing need to focus on effective means for using those networks to deliver improved instruction. One writer goes as far as to say that "Today's technology, if used differently, could bring advances that would improve education dramatically-illiteracy would be eliminated, ordinary students would make massive gains, and restraints on bright students would dissolve." (Bennett) The authors of this paper agree that the innovations instituted have made considerable instructional impact even if they do not share the fullest extent of Bennett's enthusiasm. A review of ERIC literature yields a number of studies on the use of telecommunications in the classroom in Teacher Education (Russett), the use of the Internet for University Freshman Composition (Bergland) and other similar studies. Many studies focus on the use of e-mail such as those of Granger and Chen from the 1995 IAIM conference.

It has also been documented that both performance and retention of college students have been improved through cooperative, rather than traditional individual, learning (Anson). Nevertheless, this approach fails to include the professor or regard the process as cyclical. The professor still lectures; the students study. Their relationship is hierarchical instead of synergistic. Our hope is to use interesting and academically valuable technological skills to slyly and surreptitiously teach our students elements of our course material. Mastering these skills does not remove the students' need for the teacher, but it does expose students to a wide range of computer skills and to today's electronic document exchange capabilities.

Apart from considerations of systems, however, there is an obvious practical application of our program. We are teaching courses in Information Systems. What better way to ensure that the student comprehends the subject than by requiring him/her to use those information systems in order to complete the course? While we reiterate that none of our techniques is innovative in isolation, their combination provides a prototype "hands-on" environment; students literally cannot take exams or hand in assignments without learning how the relevant system (e.g. Netscape or FTP) really works. Still there is a paucity of information on actual classroom tools supporting such standard tasks as testing, giving out assignments, handing in assignments, sharing learning, and extending the class hour to virtually unlimited time. These are some of what constitutes the infrastructure of instruction that we find can be addressed in part by the technology. The next section of the paper will discuss the individual techniques selected for inclusion in this paper.

INFORMATIONS SYSTEMS TECHNIQUES USED TO TEACH INFORMATION SYSTEMS COURSES

The World Wide Web — Online Syllabi

For each course we teach, we create a home page on a Bloomsburg University Web server to which we create a link from our individual home pages. Each course home page consists of an HTML

frame that has a list of options displayed on the left-hand area of the screen with the corresponding selection appearing to the right. The options usually include 1) a return to the professor's home page, 2) the course description, and 3) the course syllabus. Thus, if the student picks the course syllabus, the syllabus will be displayed in the right two-thirds of the screen.

On the first day of each class, students are instructed to go to a computer lab, get into Netscape, and go to the instructor's home page. From there, students are shown how to find the appropriate course syllabus. Since no paper syllabus is handed out, students must use this resource. From the first day of classes, students are actively engaged in actually using the technology we are trying to teach them; the technology comes at them not only in the form of assignments, but also in the natural course of being students in our courses trying to get information about the courses.

FTP — Delivering Assignments

Similarly, when students have assignments or papers to hand in, they no longer submit disks or hard copy. All work is handed in electronically over the campus TCP/IP system using the File Transfer Protocol (ftp). FTP is a service that allows files to be copied from on machine to another over a TCP/IP network, such as the Internet.

Each of the authors has set up an ftp server on his office machine, which runs 24 hours a day under normal circumstances. The FTP server software chosen is called Serv-U, which is a shareware package; for a fee of about $20.00, one can get a very robust FTP server with an easy to understand interface. Using client ftp software available in all computer labs and in almost all home Internet setups, students can transmit their files at any time to the instructor's machine, using accounts set up specifically for each assignment.

Each account designates the course, the assignment, and the appropriate subdirectory for the assignment, so each assignment ends up exactly where we want it on our hard drives, ready to be graded. We have devised a system for creating User IDs and passwords for each assignment that has worked well for us. For example, if the course is 92.150 (Introduction to CIS) and the assignment is the first Excel assignment, the User ID would be 92.150.excel1. The password for the account is always the same as whatever comes after the last period in the User ID, therefore the password in this case would be excel1. Creating the account lists by assignment, rather than by individual student, saves us a lot of time and effort. However, it does mean that the students must have a system for naming their files, because duplicate filenames cannot exist. Our system is to require students to name the files they submit by their last names and assignment number. Under this system, Carl Chimi's first Excel assignment file would be called chimi1.xls. In the event of duplicate last names, the initial of the first name, or some other convenient discriminator, is used, e.g. chimic1.xls (Carl Chimi) and chimij1.xls (Jeanine Chimi). Also, if a student submits a file, but then wishes to revise it, s/he must rename the revised file using a letter, e.g. chimic1b.xls. Only the latest version of the file is used for grading purposes.

Accounts are turned off at the designated due time, so late submissions are not possible through ftp. This system has many advantages, not the least of which is that, if performed correctly, it forces the student to have a backup copy of his or her assignment. We know of colleagues who encourage file submissions via attachments to email messages, and we teach this technique in classes where it is appropriate. We feel, however that the FTP method is superior for general assignment delivery, because it puts the files right in the subdirectories on our hard drives where they belong. E-mail attachments have to be unattached and manually placed where they belong.

The World Wide Web — Online Exams

Examinations are rarely given on paper in our classes anymore. For each exam, an electronic template is created using a shareware product called Webforms. This automatically sets up an HTML copy of the exam but, more importantly, Webforms also contains functions for collecting the data for each student's exam into a Microsoft Access database, whence it can easily be graded. While this process can be time consuming on the front end for the instructor, it has many advantages. The important point is that students have to use the technology in order to take the exam (and they all learn to do it very quickly because they have to).

Webforms, like Serv-U, is a shareware package requiring a nominal registration fee (about $30.00). The interface can be a little tricky, but a familiarity with creating forms in HTML will make it easier to work with. Using Webforms, one creates the basic structure of the exam, i.e. all of the fields to be filled in (e.g. name and student number, text areas for essay questions, radio buttons for True/False or Multiple Choice questions), text to be displayed (questions, instructions, etc.), email address where the exam answers are to be sent, and submission and reset buttons. Once the structure is complete, Webforms will automatically generate the proper HTML code for the exam. Our experience is that Webforms, while very good, will not generate a completely useable HTML test; usually another HTML editor such as Netscape Communicator or the Windows Notepad is used to finalize the look of the exam.

The HTML exam file is placed on a University server that runs a World Wide Web server. At exam time, the students are given the URL for the exam and instructed to use Netscape to locate it. The students are also instructed (usually during the class period before the first exam) that their answers will be sent to the instructor in the form of an email message and that , therefore, each student must know how to set up Netscape to send email. Learning this procedure is considered to be part of the test; students are told that they must know it when they take the exam, no instruction in setting up Netscape will be given on exam day. Very few students come unprepared.

When a student is finished with the exam, s/he presses a Submit button, which sends the exam answers as an email message to the instructor's email account on a University UNIX server. The instructor monitors the server, and as each exam arrives, that student is notified. At that point the student is free to close Netscape and to leave. Students should not close the exam until they know for certain that the exam has arrived in the instructor's account. Students are also free to print their exams, if they desire.

Once all of the exams have arrived in the instructor's email account, Webforms comes into play again. The professional edition of Webforms allows the user to designate a POP3 mail server (such as the UNIX mail server mentioned above). Webforms will then go out to that server, examine all of the email messages found on it, and download each message which was generated by a file (such as the HTML exam) generated by Webforms. Essentially, it downloads each exam into its internal database. Form there, Webforms can export the data out to either a text file or a Microsoft Access database with each question in its own field.

With the data in Access, it is easy to automate the grading of True/False and Multiple Choice questions; essay questions must, of course, still be graded manually. The grades are recorded in an Excel spreadsheet and pasted onto an article posted to the class newsgroup, discussed below.

Students seem to really prefer this method of taking exams to the use of pen and paper, and they have been vocal in their preference. Somehow, once they are used to taking exams this way, the process seems to flow very quickly and smoothly. As instructors, we generally prefer to give exams this way now, but we warn our readers that there is more work involved, especially on the front end, in giving tests this way. The learning curve is substantial, but not insuperable, and the whole process is more complex than just printing and photocopying an exam. Having a knowledgeable graduate assistant who can do some of the intensive labor work involved can ease some of the pain, as can the knowledge that your students are doing the very things you want them to learn in order to do something as mundane as taking a test.

USENET Newsgroups —
Course Discussions Online

The final technique to be discussed in this paper is setting up individual course-specific newsgroups for each course. A newsgroup serves as an electronic bulletin board/discussion area. Students are encouraged to contribute to these newsgroups, and participation in newsgroup discussions is factored into each student's final grade. The newsgroups have been useful for such mundane course tasks as posting due dates, hints for exams, grades, etc., but also for allowing each student to describe herself to the group, for engendering discussions about issues brought up in class, for asking questions about assignments, for answering those questions, etc. The newsgroup is a valuable tool for making information available to all.

Setting up a newsgroup for your class is relatively easy, provided you are on good terms with the people at your school who actually set up the newsgroups. At Bloomsburg University, this is the people in Academic Computing. A request to them can usually have a newsgroup set up very quickly. At Bloomsburg, a typical newsgroup for a course might be named bloomu.classes.cis.150chimi. Newsgroups in the bloom hierarchy are not available to users outside of the bloomu.edu domain on the Internet; among other things, this prevents the spamming, which is so prevalent in globally available newsgroups.

Reactions to the newsgroups have been mixed, perhaps because they are not as tightly integrated into the fabric of the course as the other technologies. Some students will use them regularly to ask questions or post hints, while others seem never to think of the newsgroups as a source for information about the course. An effort has to be made by those students initially, to check their newsgroup messages even as they check for their E-mail. Posting grades to the newsgroups, and hints for exams, seems to increase the usage, but unless a student actually posts an article to the group, it is not possible to track usage accurately.

BENEFITS OF OUR APPROACH

The current crop of undergraduates is composed mostly from the generation brought up on electronic video games, the kids who can program the VCR while parents are still fumbling through instructions. Many have had computer-aided instruction in high school, so machines are familiar to them. They tend to have short attention spans in lectures but show infinite patience sleuthing for data on the Internet. By making electronic systems an integral part of the classroom, we have found that students are less likely to be bored or distracted.

For those students who are reluctant to speak up in class, the newsgroup is an ideal pathway to true self-expression. Many instructors have found that a student who remains mum during a Q&A period will later send E-mail. Because the newsgroup is open to all, it is possible to discuss an individual's input in class without the intimidating "raising of hands." As a matter of fact, the authors have had experiences similar to the following:

> "_a woman posted a note to the group before she'd carefully composed her thoughts on the subject at hand. She regretted "peaking" too quickly, and within a few minutes had posted a retraction/revision of her previous comment. In that case, the woman was publicly going through the process of learning what she thought. The rest of us on the list (newsgroup) benefited from seeing the process."(Crump)

To pass the course, the student must have extensive knowledge of the information systems used in class. It's just not possible to skip a step or fudge a move. We have found that grade averages have improved, student enthusiasm for courses has increased, and we would like to think that each student has also achieved a higher level of self-confidence.

From the instructor's point of view, while creating an online exam has a certain level of difficulty attached to it, the automated grading is easy. Exams and syllabi no longer have to be produced far enough in advance to meet the schedules of the Duplicating Office (a major concern for at least one of the authors), and fewer trees are killed because almost no paper is used in these courses.

DRAWBACKS TO OUR APPROACH

Of course, any system that relies heavily on ancillary technologies is vulnerable to faults in or problems with those technologies. One big concern is - what if the network crashes? One has to be very flexible. For example, at the time of this writing, one of the authors is preparing to administer an online exam. The UNIX server on which the exam would normally be placed, and on which his email account resides, planetx.bloomu.edu, has been recently upgraded and is acting very erratically. Luckily, Bloomsburg University has a number of such servers, so the author has simply transferred operations over to another machine, vesta.bloomu.edu. For someone without that kind of flexibility, this could be a disaster.

Online exams are also dependent on students setting up Netscape correctly. A student may think s/her is following directions, but get one little character wrong in an address, and the

exam will not arrive. Since we do not feel that it is fair to penalize students who may have answered all of the questions correctly, but failed to send the exam, we sometimes have to help students to make sure the exam arrives.

We have still not developed a foolproof method for administering exams outside the regular classroom setting. At present, students must use the classroom machines and exams are taken under the watchful eye of a monitor. Eventually, we would like to provide a testing process that permitted each student to take the exam privately within a given time frame and to provide exams that would elicit greater self-expression and provoke more individual thinking. To date, this has not been possible.

CONCLUSION

We are still perfecting the system. It has been a worthwhile exercise to work cooperatively with students in making it truly integrated. For example, when asked whether they prefer to take exams online or on paper, our students unanimously prefer the online method. We have observed how quickly students become comfortable with and confident about using computers, both Windows- and UNIX-based. The integration of the Web with our course materials has been very rewarding, and we look forward to using the tools available in Microsoft Office97 to provide an even tighter integration.

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Serv-U may be accessed at: http://www.cat-soft.com/

Webforms may be accessed at: http://www.q-d.com/wflinks.htm